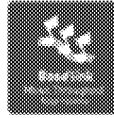


EXHIBIT Q

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Understanding Bose® link



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Document Intent

This document contains company confidential information and is intended to aid Customer-facing Bose Employees. It should not be distributed to customers, or people outside of Bose Corporation. This document is not intended to be used as an on the job reference, but as a learning tool to gain better understanding of the setup, operation, and troubleshooting of Bose link-enabled media centers.

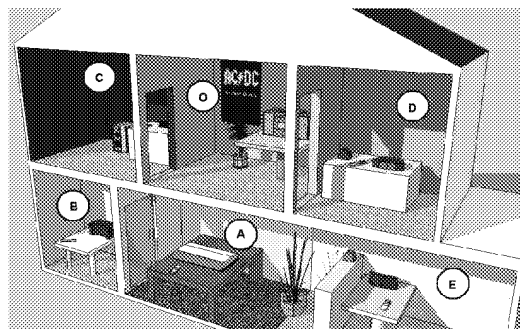


What is Bose Link?

Bose link is a communication protocol. To communicate there must be at least two participants that speak the same language. To Bose products, Bose link is that language.

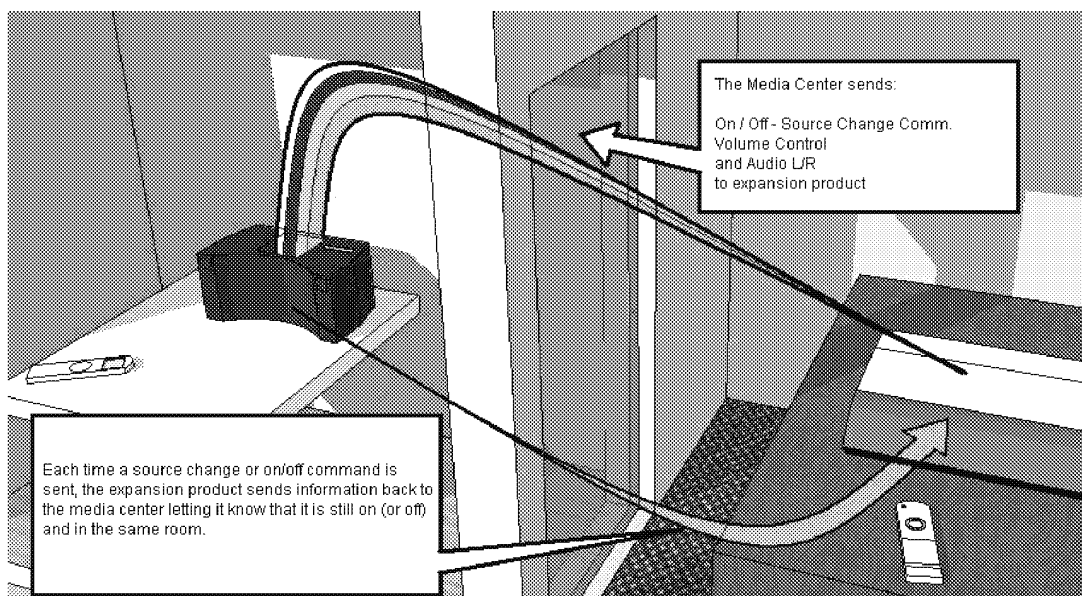
Rooms

There are 15 different rooms that can be controlled by a Bose link enabled media center. The main room – labeled room A – is reserved for the Lifestyle speaker components. The other rooms – rooms B-O – are reserved for expansion via Bose link.



For a Bose link setup to work the system must include a Bose link enabled media center (a controller), a Bose link expansion product, and an expansion remote control. Both the expansion product and the remote must be configured to operate on the same room.

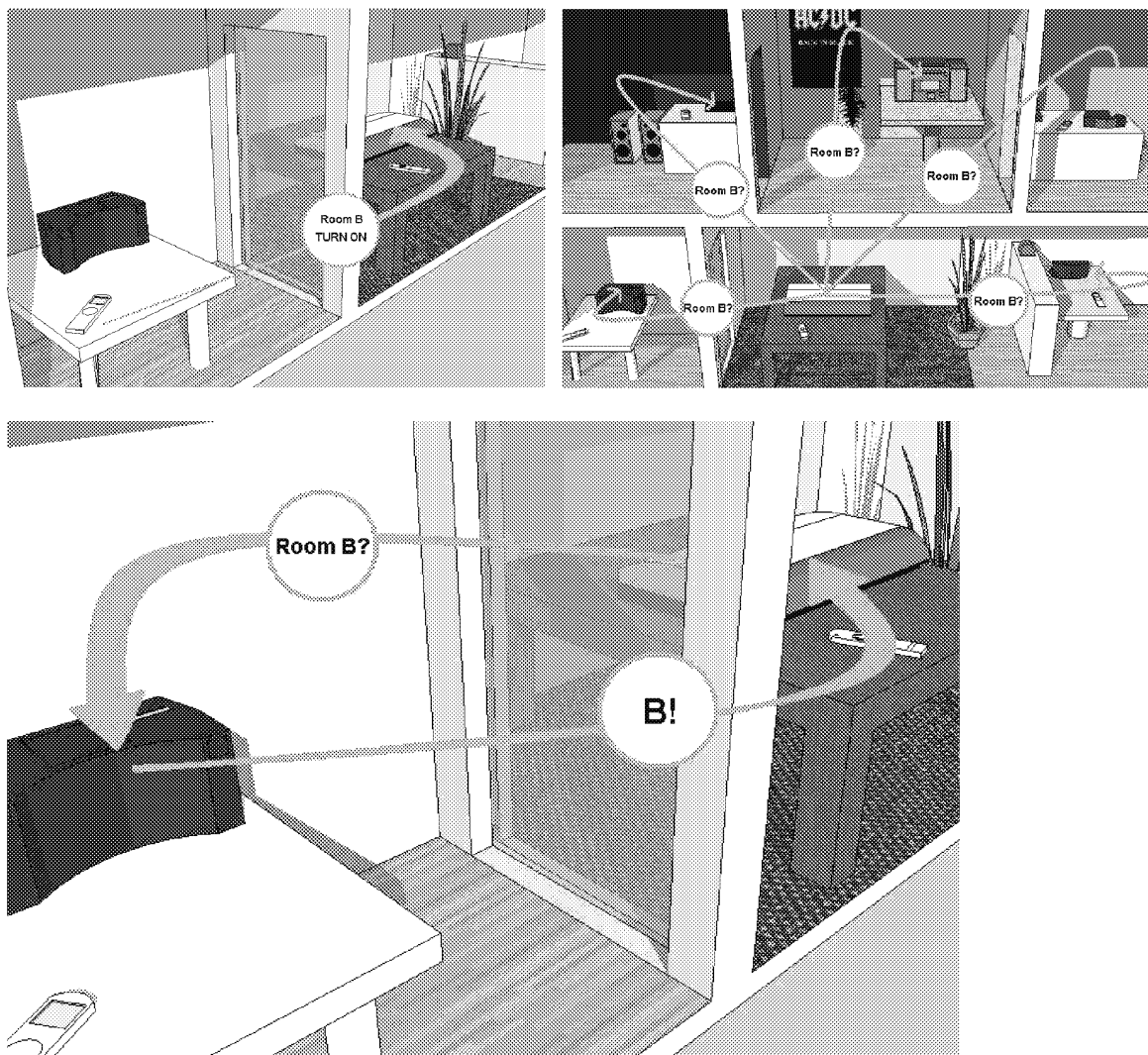
A Bose link connection is essentially a conversation between the media center and the expansion device. The media center sends on/off, volume and source change commands along with audio to the expansion product. The expansion product responds by sending information back to the media center to let it know that it is still on (or off) and in the same room. This information exchange occurs each time a power or source change command is issued by the expansion remote.



When the media center receives an ON command from an expansion remote the system turns on and checks for any Bose link products that might be connected, but it will only look for Bose link products that are assigned to the same room as the remote.



If the media center receives a command from a remote configured for room B, for example, the media center calls out to other Bose link products which might be assigned to room B. If a connected expansion product is assigned to room B it will respond to the media center and a Bose link connection will be made. The media center will not acknowledge a response from anything not assigned to room B.



The media center will not acknowledge more than one response from the same room, either. As with any productive conversation, there can only be one person speaking at a time. If more than one product is assigned to room B the media center won't know which one to listen to. If the media center can't understand the response from the expansion products, or if there is no response at all, the media center will turn itself off and the Bose link connection will not be successful.



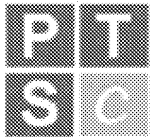
Streams

A Bose link enabled media center is also capable of managing two separate sources at the same time. Each source can be sent to one of two different outputs - or 'streams' - within the Bose link connection. 4 of the 9 pins that make up the Bose link connection on the back of the media are responsible for delivering these streams - all of which are analog. Two pins are reserved for stream 1 audio L/R (fixed), and another two pins carry stream 2 audio L/R (fixed) - (there is another pair of pins that carry variable stream 2 audio that will be discussed later). Every Bose link expansion product has 2 inputs to accommodate each stream, and the remote control tells the device which stream to listen to. The expansion products receive fixed audio and then control volume via commands they receive from the media center carried on other pins.

Here is an example:

If an expansion remote configured for stream 1 sends an ON command to the media center, the media center will activate the pins that carry stream 1 information. The media center will also call out to any Bose link product set to the same room code as the remote. If the media center gets an answer it can understand, it will respond by telling the expansion product to turn on and listen to its stream 1 inputs. If the media center does not get a response from an expansion product set to the same room as the remote it will simply turn itself off.

The main room, or room A, can only operate on stream 1. Although any of the expansion rooms can be configured to operate on either stream 1 or stream 2, expansion rooms are generally assigned to stream 2. Since only one source can be sent to each stream at any given time, keeping Bose link expansion products on stream 2 prevents changes made in expansion rooms from affecting what is being played in the main room, and vice-versa.



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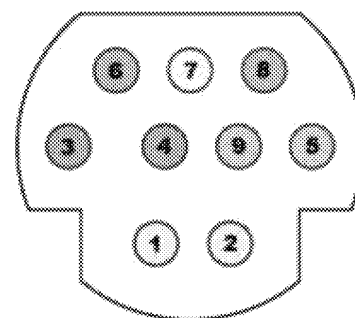


“A” Cables vs. “B” Cables

There are two types of Bose link cables available to end consumers – “A” cables and “B” cables. Each cable uses circular 9-pin connectors on either end. The difference between the two types is in how they are wired. “A” cables contain 9 wires that correspond to each of the 9 pins on the connector. Here is a detail of what each pin carries:

Bose Link A Cables

1. **Variable Stream 2 Left**
2. **Variable Stream 2 Right**
3. **Fixed Stream 2 Left**
4. **Fixed Stream 2 Right**
5. **Fixed Stream 1 Right**
6. **Turn On** (this is a 10v turn on signal that some expansion products require)
7. **Data** (this carries volume, on/off and local source commands)
8. **Ground**
9. **Fixed Stream 1 Left**

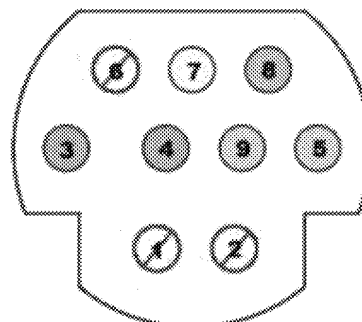


Boselink “A” Cable

“B” cables have only 6 of the 9 pins wired. The two pins that carry variable stream 2 information and the one pin that carries the 10v turn on voltage are not wired.

Bose Link B Cables

1. **Not Wired**
2. **Not Wired**
3. **Fixed Stream 2 Left**
4. **Fixed Stream 2 Right**
5. **Fixed Stream 1 Right**
6. **Not Wired**
7. **Data** (this carries volume, on/off and local source commands)
8. **Ground**
9. **Fixed Stream 1 Left**



Boselink “B” Cable

The need for two different wires is due to the Wave Music System and the Wave Radio II. To power the IC-1, these systems utilize pin 6 to send out the voltage required. Connecting a Bose link A cable to a WMS would mean that you were connecting the outputs of two different power sources together. This would likely cause some type of damage. Variable stream 2 wires were also omitted because they are never used by a Bose link device (more on variable stream 2 below).

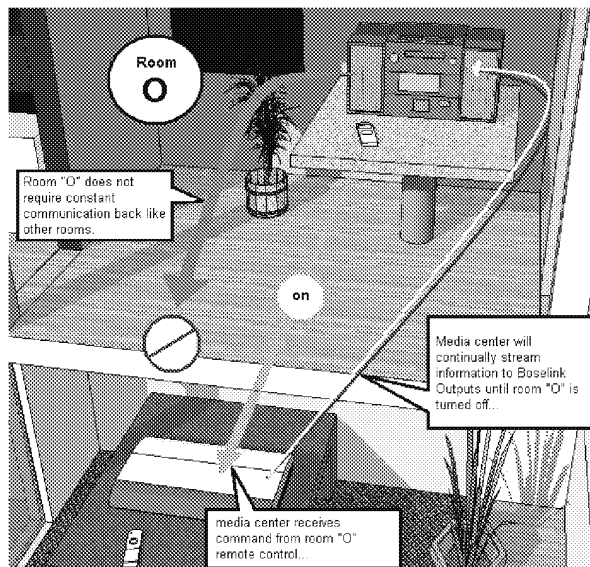
The 4-way Bose link 50' extension cables are wired as “A” cables. All Bose link cables are capable of delivering a signal up to 150' feet from the media center. If a “B” cable is connected anywhere in the path between two devices, the run will act as a “B” cable run.


BOSE®

Non Bose Link Expansion

Only Bose link products can speak the Bose link language, so how can customers use non-Bose link products for expansion? The secret is in room O.

A media center under the command of a remote set to room O will continue to stream information to its Bose link outputs until room O is turned off. It does not require constant communication back and forth like it would in other rooms. This enables non-Bose link products (Bose and non-Bose) to become part of a Bose link system.



Special adapters have been designed that convert the 9-pin Bose link connection to a single pair of stereo RCA cables which can interface with most products. There are two types of adapters available – a Fixed version and a Variable version. The Fixed version taps into the two pins responsible for carrying fixed stream 2 audio (pins 3 and 4). The Variable version taps into pins that carry a variable version of stream 2 audio (pins 1 and 2). These variable outputs enable volume control via the Bose link expansion remote, but require the destination system to be set to maximum volume. Another disadvantage to using one of these adapters is that the expansion room will be restricted to stream 2 audio only since they never touch the stream 1 signal (pins 5 and 9).

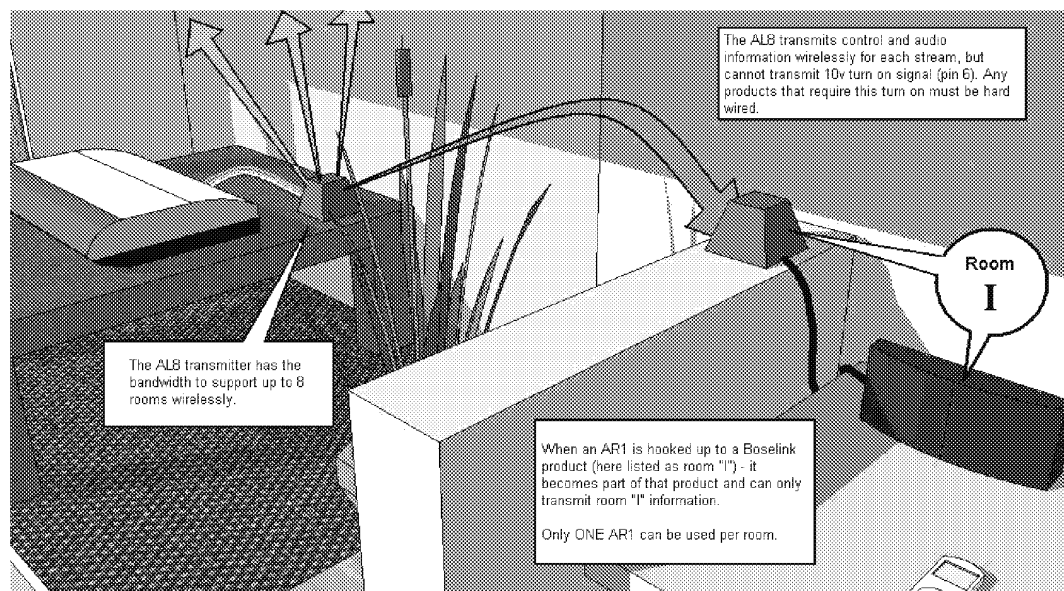
Bose link enabled media centers also have the capability of interfacing with older – or “Legacy” - Bose products that do not speak the Bose link language. An Audio option within the System menu allows the user to switch the protocol between Bose link and Legacy. This setting changes the type of information that is transmitted on pin 7. In this way the media center is bi-lingual, and it enables communication with older products like the SA1. The media center can only speak one language at a time, however, so if the protocol is set to Legacy the media center will not be able to communicate with Bose link expansion products.



Wireless Bose Link (AL8)

The AL8 transmitter has the bandwidth to support up to 8 rooms wirelessly. It is capable of transmitting control and audio information for each stream, but it cannot reproduce the 10v turn on voltage carried by pin 6. This means that any expansion product requiring this turn on signal must be hard wired.

When an AR1 receiver is connected to a Bose link product, it *becomes* part of that product. When an AR1 is used on a Lifestyle RoomMate set to room I, for example, the AR1 will essentially become a room I product and will only be able to transmit room I information. That is why only one AR1 can be used per room.

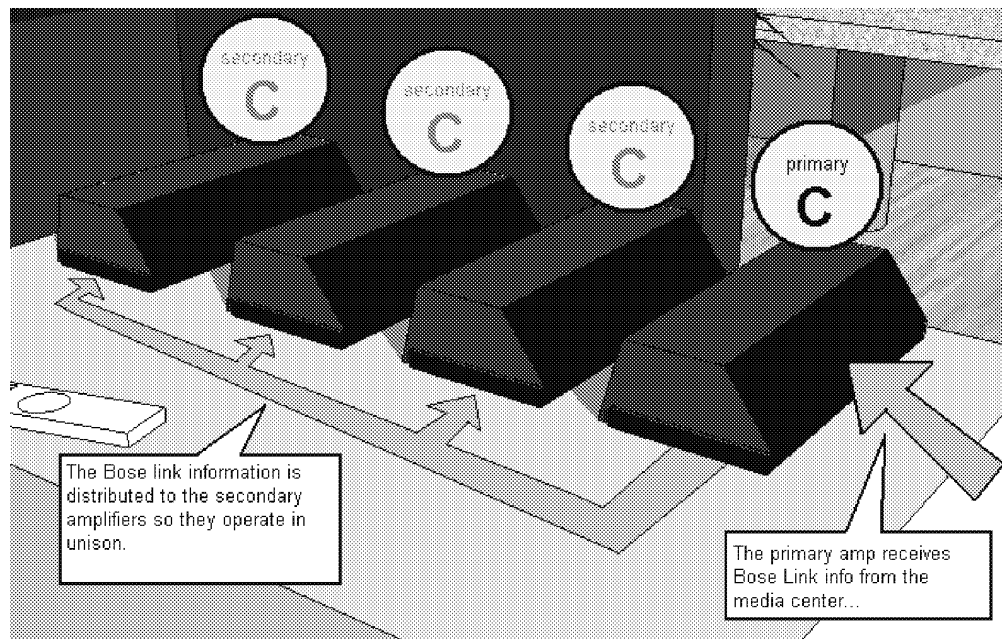


The AL8 can also be used to transmit to room O, however, it should not be used to transmit a variable signal. There are two reasons for this. First, sound quality may suffer. The AL8 will amplify the noise floor on a variable signal and that will usually produce undesirable results. Secondly, and most importantly, the AL8 has a minimum input signal requirement. If the input signal falls below a certain threshold, the AL8 will turn itself off. This means that listening at lower volumes may result in an unwanted shut down. Anyone who uses an AL8 on room O must transmit a fixed signal and therefore must control volume at the destination device.



SA2 and SA3 Amplifiers

The SA2 and SA3 amplifiers are currently the only products that can be assigned to the same Bose link room simultaneously with multiple amps. To do this, one amp must be set up as the primary and up to three supplemental amps can be added (three is the recommended maximum). In this configuration the primary amp receives Bose link information from the media center and distributes it to the supplemental amps so they operate in unison. This enables users to expand beyond the 14 expansion rooms if needed. A total of 17 devices can operate off of a single Bose link output with standard wiring ("A" and "B" cables), however custom wiring could potentially enable even more.



The SA2 and SA3 amps can also be connected to an external volume control. This volume control is essentially a variable resistor that will override any Bose link volume command. When this volume control is used on more than one amp in a Bose link setup, they can also be used to level the volume of the different amps being used in tandem. If the primary and supplemental amps are configured in any room ranging from B – H, the volume controls connected to the supplemental amps will act as volume levelers. This means that they will still respond to Bose link volume commands, but the local volume controls will scale the volume relative to the primary amp. This enables users to level all the amps so they have consistent output, which comes in handy if different speakers are being used across the different amps.

If the primary and supplemental amps with volume controls are configured in any room ranging from I – N, each amp will ignore Bose link volume commands completely. This enables independent volume control over each amp. Each amp will still be playing the same source, but the supplemental amps will not change volume when the primary amp does. Some customers may prefer this setup, so the option is available. (NOTE – this is true only of amps manufactured after DOM 6058. Amps made before this date will volume level in every room).